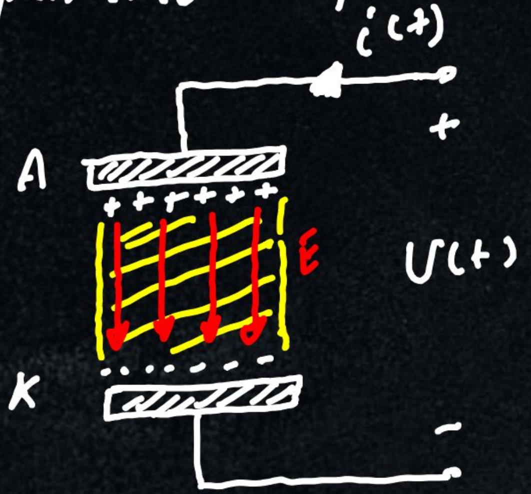
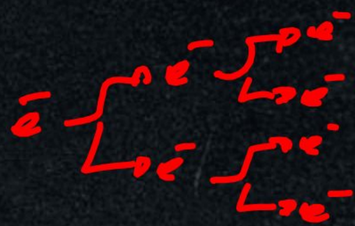
CH 6 :- Capacitor and inductor models

Capacitor :- It stores energy in the electric field. It is often fabricated by two parallel conducting plates separated by an insulation layer



$\bar{e} + A \rightarrow \bar{e} + \bar{e} + A^{+}$

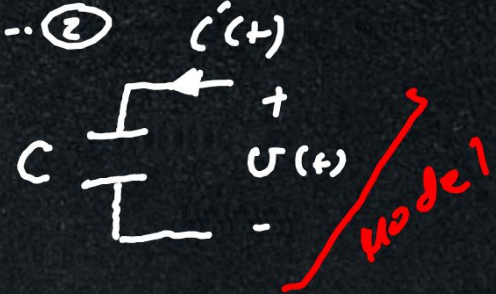


$$C = \frac{q}{v}$$

$$C = \frac{dq}{dv} \quad \text{---} \ 1$$

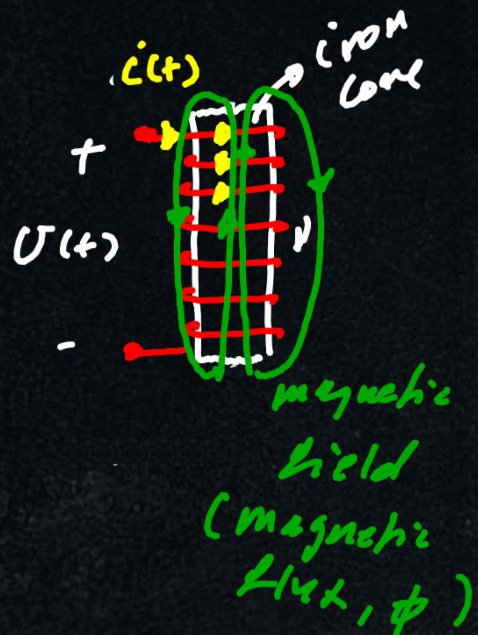
$$i(t) = \frac{dq}{dt} \Rightarrow dq = i(t)\,dt \quad \text{---} \ 2$$

$$2 \rightarrow 1 \Rightarrow C = \frac{i(t)\,dt}{dv(t)} \Rightarrow \boxed{i(t) = C\,\frac{dv(t)}{dt}}$$



Inductor :- It stores the magnetic field

Examples → - Coils of wires to make an electromagnet
- Windings in electric motor



Ampere's law

$$\phi = P N i \; ; \text{ where } P \text{ is the permeance}$$

$$P = \frac{\mu_0 \mu_r A}{l}$$

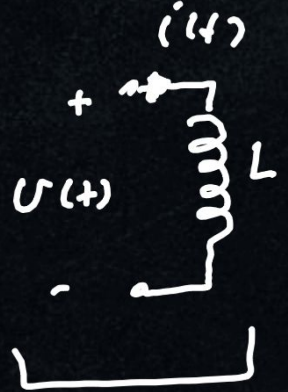
Faraday's law

$$v(t) = N \frac{d\phi}{dt}$$

$$e_{ind} = N \frac{d\phi}{dt}$$

$$v(t) = N \frac{d}{dt}(PNi) = PN^2 \frac{di}{dt} = L \frac{di}{dt}$$

where $L = PN^2$



$$v(t) = L\frac{d(i(t))}{dt}$$